Global Hydrology Resource Center

Data User Guide

GPM Ground Validation Iowa X-band Polarimetric Mobile Doppler Weather Radars IFloodS

Introduction

The GPM Ground Validation Iowa X-band Polarimetric Mobile Doppler Weather Radars dataset was gathered during the IFloodS campaign from May to June 2013 throughout central and northeastern Iowa. Four X-band Polarimetric (XPOL) Mobile Doppler Weather Radars were used to collected high-resolution observations of precipitation. The dataset consists of several parameters needed to study precipitation, including reflectivity, Doppler velocity, spectrum width, differential reflectivity, differential phase, copolar correlation coefficient, and sound-to-noise ratios. These data are available in netCDF files and browse images are available in .png format files.

Citation

Krajewski, W. F. and K. V. Mishra. 2015. GPM Ground Validation Iowa X-band Polarimetric Mobile Doppler Weather Radars IFloodS [indicate subset used]. Dataset available online from the NASA EOSDIS Global Hydrology Resource Center Distributed Active Archive Center, Huntsville, Alabama, U.S.A. doi: http://dx.doi.org//10.5067/GPMGV/IFLOODS/XPOL/DATA201

Keywords:

NASA, GHRC, Iowa, University of Iowa, IFloodS, GPM GV, XPOL, X-band Polarimetric Mobile Doppler Weather Radar, reflectivity, Doppler velocity, spectrum width, differential reflectivity, differential phase, copolar correlation coefficient, Signal-to-Noise Ratio;

Campaign

The Global Precipitation Measurement mission Ground Validation (GPM GV) campaign used a variety of methods for validation of GPM satellite constellation measurements prior to and after launch of the GPM Core Satellite, which launched on February 27, 2014. The

instrument validation effort included numerous GPM-specific and joint agency/international external field campaigns, using state of the art cloud and precipitation observational infrastructure (polarimetric radars, profilers, rain gauges, and disdrometers). These field campaigns accounted for the majority of the effort and resources expended by GPM GV. More information about the GPM mission is at https://pmm.nasa.gov/GPM/.

The Iowa Flood Studies (IFloodS) was a ground measurement campaign that took place throughout Iowa from May 1 to June 15, 2013. The main goal of IFloodS was to evaluate how well the GPM satellite rainfall data can be used for flood forecasting. Specifically, this meant collecting detailed measurements of precipitation at the Earth's surface using ground instruments and advanced weather radars and simultaneously collecting data from satellites passing overhead. The ground instruments characterize precipitation – the size and shape of raindrops, the physics of ice and liquid particles throughout the cloud and below as it falls, temperature, air moisture, and distribution of different size droplets – to improve rainfall estimates from the satellites, and in particular the algorithms that interpret raw data for the GPM mission's Core Observatory satellite, which launched in 2014. More information about IFloodS is available at http://gpm.nsstc.nasa.gov/ifloods/. Additional information about the Iowa Flood Center is available at http://iowafloodcenter.org/.

Instrument Description

The Iowa XPOL radars were part of the IFloodS campaign during May to June 2013 in central and northeastern Iowa. Data were collected in high resolution using multiple XPOL radars referred to as XPOL-2, XPOL-4, and XPOL-5. The XPOL-2 and XPOL-4 were placed near each other. This provided overlapping readings. These radars made polarimetric observations at 30 m and 75 m range resolutions with range sample spacings of 7.5 m, 15 m, 30 m, and 75 m at the scan rate of 5 degrees per second in Plan Position Indicator (PPI) and Range-Height Indicator (RHI) scan types. More information about the XPOL radars is available in Mishra et al., 2015.

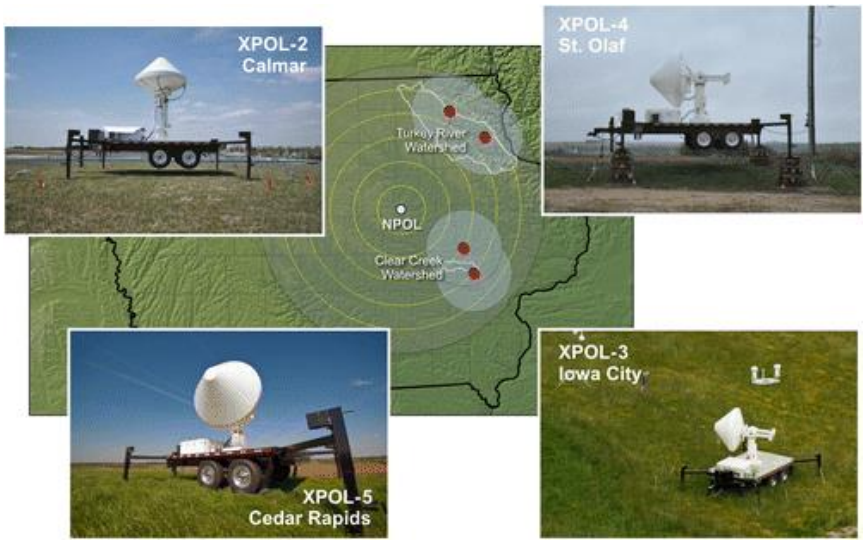

Figure 1: The four XPOL radars used to collect the Iowa X-band Polarimetric Mobile Doppler Weather Radars IFloodS data. Image source: Mishra et al., 2015.

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File Naming Convention

The Iowa X-Band Polarimetric Mobile Doppler Weather Radars IFloodS data having the following naming convention:

Data File: MXPOL#-polar-YYYYMMDD-HHmmss-XXX-EEE_*.nc
Browse File: XXX-Psidp-MXPOL#-5-YYYYMMDD-HHmm-ss-el_RR_75_RGS_75.png

Table 1: File naming convention variables

Variable	Description
#	Weather radar number (2, 4, or 5)
YYYY	Four-digit year
MM	Two-digit month
DD	Two-digit day
HH	Two-digit hour in UTC
mm	Two-digit minute in UTC

ss	Two-digit second in UTC
XXX	Scan types (RHI or PPI)
EEE	If XXX=RHI, EEE is three-digit azimuth in degrees If XXX=PPI, EEE is three-digit elevation in degrees
*	Tilt in degrees
.nc	netCDF file format
el	Elevation in degrees
.png	Portable Network Graphics file format

Data Format Description

The Iowa X-band Polarimetric Mobile Doppler Weather Radars IFloodS data are available in netCDF format files and associated browse images are available in .png format.

Table 2: Data Characteristics

Characteristic	Description
Platform	ground station
Instrument	XPOL Mobile Doppler Weather Radar: XPOL-2, XPOL-4, and XPOL-5
Projection	N/A
Spatial Coverage	N: 43.54 , S: 41.28, E: -90.91, W: -92.35 (Iowa)
Spatial Resolution	40 km
Temporal Coverage	Start date: April 30, 2013 Stop date: June 16, 2013
Temporal Resolution	variable
Sampling Frequency	variable
Parameter	reflectivity, Doppler velocity, spectrum width, differential reflectivity, differential phase, copolar correlation coefficient, Signal-to-Noise Ratio
Version	final
Processing Level	2

Data Parameters

Each file consists of reflectivity, Doppler velocity, spectrum width, differential reflectivity, differential phase, copolar correlation coefficient, and Sound-to-Noise Ratios. More information about how these data parameters were collected and derived is available in Mishra et al., 2015.

Quality Assessment

If there was substantial blockage during a PPI or RHI scan, then 1 or 2 degree elevation scans were excluded. A series of processing steps used to correct for attenuation for XPOL-4 data are described in Mishra et al., 2015. More information about the uncertainties in radar rainfall estimates is available in Villarini et al., 2010 and Mishra et al., 2015.

Software

No special software is needed to read these netCDF data files; however, Panoply is an easy-to-use free tool for reading and visualizing the data within the netCDF file.

References

Mishra, K. V., W. F. Krajewski, R. Goska, D. Ceynar, B. C. Seo, A. Kruger, et al., 2015: Deployment and performance analyses of high-resolution Iowa XPOL radar system during the NASA IFloodS campaign. American Meteorological Society (AMS) Journal of Hydrometeorology, 17, 455-479. doi: 10.1175/JHM-D-15-0029.1.

Villarini, G. and W. F. Krajewski, 2010: Review of the different sources of uncertainty in single polarization radar-based estimates of rainfall. Surv. Geophys., 31, 107-129. doi: 10.1007/s10712-009-9079-x.

Users are advised to also look at documentation provided by the Principal Investigator of this dataset.

Contact Information

To order these data or for further information, please contact:

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